THE INFLAMED EYE—SOME COMMENTS ON ITS DIAGNOSIS.*

By GEORGE H. KRESS, B. S., M. D., Los Angeles.

The subject of the inflamed eye, and its diagnosis, is taken up before this society of general practitioners, not so much because it is possible to present much that is new or startling, as for the reason that the inflamed eye, as such, is often first seen by the general practitioner; and because the subsequent cosmetic and economic efficiency of both the eye and the individual can be said in certain of the graver of inflammatory conditions of the organ of vision, to depend largely upon what steps are taken in the way of treatment at the beginning of the trouble.

Diagnosis becomes, therefore, a matter of considerable importance. In discussing the diagnosis of the inflamed eye, it is necessary to keep in mind certain of its anatomical characteristics, because the symptoms are often largely dependent upon the peculiar anatomy of this organ; and a brief review of these will therefore be first outlined.

A BRIEF SURVEY OF THE ANATOMY OF THE EYE.

To begin then, as regards the bony orbit. There must be kept in mind the connection with the neighboring nasal sinuses, and the possibility of extension of inflammation from these adjacent cavities. Likewise, must be remembered the adherent periosteum of the bony orbit, and the very loose meshwork of connective and fat tissue in which the eyeball is virtually slung.

In the eyelids, there is also a great amount of connective tissue, interspersed with the cartilages and Meibomian glands. Malposition of eyelashes can be sources of irritation, also.

At the inner angles, the lacrimal puncta, and the lacrimal canals and sacs, present problems of drainage and possible infection.

The conjunctiva upon the internal aspect of the lids is quite loose, and is freely supplied with blood vessels; upon the white sclera it is much less loosely applied; and upon the cornea, the single layer of conjunctival epithelium is most firmly attached. The conjunctiva, in its function as a mucous membrane, must be remembered as having a direct connection with the mucous membrane of the nasal and oral cavities.

In the cornea, we have to deal with the clear window-like structure that covers the anterior fifth of the eye, and which consists of three layers; the thin anterior layer of epithelial cells resting on the homogeneous Bowman's membrane; the major or middle layer being largely a specialized connective tissue stratum; and the posterior surface being likewise of a somewhat homogeneous character, with a layer of endothelium, as described by Descemet. This non-vascular corneal structure has coursing throughout, a very large number of non-medullated nerve fibres, whose great sensitiveness gives prompt warning of injury to the structure.

In the white sclera, or outer covering of the remaining portion of the eye, we deal virtually with a continuation of the sheath of the optic nerve, the whole being of a quite fibrous and firm makeup.

The iris, or curtain of the eye, presents the center aperture, or pupil, and gives us for consideration, a somewhat circular and contractile tissue, composed of elastic and muscular fibres and blood vessels. The ligament of the iris permits it to hang in the aqueous humor cavity between cornea and lens, so as to divide that space into two parts, the anterior and posterior chambers.

In the middle coat of the eye, or choroid, we deal with what is usually a very much pigmented structure, and which is most generously supplied with blood vessels. At the margin of the cornea, the edge of the choroid slips forward to form a sort of frill, to which we give the name of the ciliary processes.

Internal to the choroid of the eye, we have to consider the retina, which is nothing else than the extension forward in an expanded form of the optic nerve.

The vascular supply of the various tissues just enumerated, and the intimate anastomosis of some of the different groups of vessels, is very important in the interpretation of the symptomatology of inflammatory eye conditions. The possibility of great extravasation of serum and blood into the loose orbital tissue from the ordinary blood vessels of the orbit, is a phenomenon with which all are familiar. The ophthalmic arteries and veins which enter with the optic nerve, in themselves, however, are not so often concerned with external inflammations of the eye.

The blood vessels of the conjunctiva can usually be recognized as they pursue their winding course forward, their color being brighter, and they being moved easily with the conjunctiva itself.

The non-vascular nature of the cornea has already been mentioned, but outside its edge, or limbus, we have the anterior ciliary arteries, which coming forward along the recti muscles, perforate the sclera in this region. The sclera, farther back, about one centimeter or so away from the limbus, is also pierced by the posterior ciliary vessels, which proceed forward and anastomose with the anterior ciliary arteries. The anastomosis of the various sets of blood vessels has much to do with giving any information of the eye, its "special color" or picture.

So much for the discussion of some of the anatomical features of the eye, which, as stated before, are taken up here only because in the presentation of symptoms, a clear picture of the anatomy will help make easier an understanding and interpretation, of the subjective and objective phenomena as met with in inflammatory conditions.

THE OBJECTIVE AND SUBJECTIVE EXAMINATIONS OF THE INFLAMED EYE.

So much dependent upon the vascular phenomena are the pictures of inflammatory conditions of the eye, and so closely interrelated are these vascular supplies of the different eye tunics, that the inflammatory condition as it first confronts the physician, only too often presents a picture that is

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confusing; because when the eye is seen for the first time, the secondary irritation may in good part obscure the original features of the disease process. On that account, a carefully taken history will aid greatly in the making of the differential diagnosis.

History. First, then, it is important to know whether one or both eyes are affected, and if both, which the more, and to know the date of onset of the condition, and the chief symptoms which are complained of.

In the matter of pain or tenderness, its location, kind and duration can be important. Sensations such as itching, feeling of sand, or other discomfort, such as smarting of the lids, may be facts worthy of note. The flow of tears and the amount; headache, location, type and periods during which it is most aggravated; and visual acuity, whether it is obscured or materially diminished, must not be forgotten.

In connection with the subject of visual acuity, it may well be asked whether every general practitioner should not have as a part of his general office equipment, an eye chart designed for the testing of distant vision. The chart arranged by the A. M. A. Conservation of Vision Committee, and which can be purchased from F. A. Hardy & Co., Chicago, at a cost of twenty-five cents, is one which contains full directions, and which is very well adapted for such tests.

The above belong to the subjective phenomena met with in external inflammatory conditions of the eye. In inflamed eyes, the objective examination usually concerns itself first with those signs which can be determined by daylight.

Daylight Examination.

Daylight Examination. Under this head the following items must be noted: Whether or not the eye is congested, and if so, whether this congestion seems to be more limited or centralized to the conjunctiva of the lids; to the region of the corneal limbus; or whether it is of a more posterior and of a deeper or episcleral type.

The amount of discharge, whether of a simple or purulent character; and the condition of the tear sac, and whether pressure exposes any abnormal secretion therefrom.

The patient's dread of light, or photophobia; blinking and nystagmus; the condition of the lashes and lid margins.

The tension of the eyeball, as taken through the gently closed lids with the finger tips (or if in doubt, with the instrument known as the tonometer).

The condition of the conjunctiva, both of the lid and globe and of the sulcus folds.

In the window of the eye, or cornea, the existence of ulceration, the presence of foreign bodies, or of opacities of different degrees of density.

In the anterior chamber, there may be a change in the depth, or the aqueous may be less clear; or there may be an exudate, such as a pus exudate (hypopyon), or there may be a blood extravasation (hyphema).

The iris may be changed in color, and its markings less distinct; it may be tremulous, or its pupillary edges may be attached to the lens capsule by adhesions.

The pupil may take an irregular shape, owing to adhesions; and its capacity and rapidity to react to light, and also to accommodate, and whether the size of the pupil is the same in both eyes, all must be taken into account.

The above are some of the major phenomena to consider in the examination with daylight.

Dark Room Examination. In the dark room, or in a partially dark room, an ordinary hand flashlight lamp, held to throw light upon the eye cavities, can corroborate or make plainer some of the conditions just noted.

If one has the regular ophthalmoscope, or what is easier to work with and especially much more easy for the general practitioner, one of the electric ophthalmoscopes, one is able, with no lens in the aperture and at a foot's distance or so, to come to a better understanding regarding the exact form and density of foreign bodies, or opacities, in the cornea; and then by swinging the wheel to bring into range the plus 16 diopter lens, and then examining the eye at the focus of that lens, one can corroborate still more of what was previously observed. With the ophthalmoscope, too, it will be possible to determine the presence of opacities and foreign bodies in the media and the fundus. The intensity of the red fundus reflex will also tell one promptly the general condition of the interior of the globe, and with the proper lens, the exact condition of the fundus may in most instances be observed.

Those of you who meet with eye conditions in your work, may find the copies of the charts which were devised by the writer for use in the State University Clinic, at Los Angeles, to be not without some interest and some value as a means of rapidly obtaining and tabulating a fairly complete history. (See adjacent pages for copies of these charts.)

Referring to these charts, you will note that on the front of these five- by eight-inch filing cards, there is a spacing for longhand histories at the top of the page (for the three questions of date of onset, eye most involved, and the chief symptoms), which can be continued on the other side in the third column. Also that the arrangement of the card divides into two major groups, the subjective and the objective examinations; subdividing the objective into those signs that are noted by daylight, and those that are noted in the dark room (these latter, or dark room inspections, being carried on first by means of a flashlight lamp for oblique illumination, with or without a magnifying lens, or with magnifying spectacles; and second, with the ophthalmoscope, with and without lenses of varying degree).

With a history taken along the lines indicated, we have gathered on the whole data upon which the diagnosis will be made, and this portion of our subject can now be considered.

THE DIFFERENTIAL DIAGNOSIS OF THE MAJOR GROUPS OF INFLAMMATORY EYE CONDITIONS.

The particular group of inflammations of the

Surname | Given Name { Mr. / Mrs. / Miss } | Address | St., City

Card Number | Date | 1. Race | 2. Sex (M.F.) | 3. Age | 4. Social (S. Md. Wid.) | 5. Nativity | 6. Occupation

7. History (*Note: Write here chief organs and sites affected, date of onset; and notes, if pertinent, on personal and family history, previous eye diseases, chief symptoms, outline of previous treatment; present treatment; course, etc.*)

(*Note: This history, with treatment, etc., is continued on the other side. See item 46*

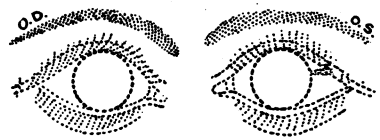
8. Tentative Diagnosis is

8a. Final Diagnosis is

8b. This patient in service of Dr.

8c. This history taken by Dr.

9. Outline of Treatment:



I. SUBJECTIVE EXAMINATION

10. State here what eyes are referred to O.U. O.D. O.S.

11. Pain { Location / Kind / Duration }

12. Sensation { Smarting / Itching / Sandy / Discomfort }

13. Lacrimation { Amount / Character }

14. Reflex { Headache { Location / Character / Time worst } / Indigestion / Neurasthenia }

15. Visual acuity { Distance { O.D. / O.S. } / Near O.D. reads No._____ at_____" / O.S. " No._____ at_____" / Date of onset dimin. vision / Dark spots before eyes }

II. OBJECTIVE EXAMINATION

A. DAY LIGHT

16. Congestion { Conjunctival / Corneal circumcorneal / Episcleral / Subconj. hemorrhage }

17. Lachrymation increased

18. Discharge { Amount / Character }

19. Photophobia

20. Blinking

21. Nystagmus { Horizontal to / Vertical / Rotatory }

22. Palpation { Increased tens / Decreased tens / Tonometer registers }

23. Lids { Swollen / Power closing / Edges }

24. Tear Sac (On pressure)

25. Cilia

26. Conjunctiva { Upper { Bulbar / Tarsal / Retro-tarsal } / Lower { Bulbar / Tarsal / Retro-tarsal } }

27. Cornea { Inflammation / Ulceration (draw diagram) / Vascularized / Opacities / Foreign bodies / Sensitiveness / Reflexes }

28. Ant. Chamber { Depth / Clearness / Exud. etc. { Hypopyon / Hyphaema } }

29. Iris { Color / Tremulous / Adhesions (diagram) }

30. Pupil { Size / Shape / Light reaction }

31. Miscellaneous

Note: For dark-room, vision tests, etc., see other side.

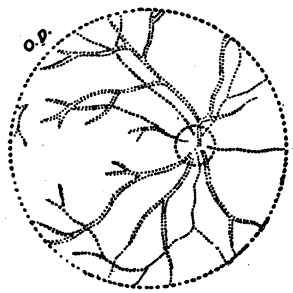
INSTRUCTIONS TO CLINICIANS—Write plainly; strive to keep records accurate and up-to-date. Plus sign (+) indicates yes or positive; zero sign (0) indicates no or negative. You can underline special symptoms to draw attention, if desired. When neither yes or no sign is used, it is assumed no abnormalities are present. Draw diagrams when possible. (Arranged by G.H.K., Oct. 10, 1913).

Continuation of History of Card No. Patient Named

II. OBJECTIVE EXAMINATION, (*Cont'd*)

B. Dark-Room

32. Oblique Illumination { Media clear / Opacities { Shape / Color }
33. Opthalmoscope (Indirect Ex.)
34. Opthalmoscope at 16″=Media.....Clear
34. Opthalmoscope with +16 D. lens=
35. Opthalmoscope (direct ex.)



Right Eye O.D.

- Disc.
  - Shape is circular .....
  - Color is rose-reddish .....
  - Edge is.....well defined; .....tendency to merge off .....
  - Cup is.....sm., mod., large; shallow, deep
  - Chor. ring is.....faint, thick: all round, more on.....side
  - Scleral ring is.....faintly present
  - Lamina does not show.....
- Bld. Vess.
  - Number and course.....approx. normal
  - Light reflexes.....good on veins and art
  - Feeble, moderate, marked pulsation of following veins.....
  - Tortuosity of following bld-vess. .....
- Mac. Reg. { Col. reddish. One.....bright foveal dot present .....
- Fund. { Fundus of feeble, moderate, pronounced blonde, brunette type..... / Pigmen.....homogen.; .....tessellated

36. Left Eye O.S { Approximates O.D. except as follows:

III. REFRACTION TESTS

37. Opthalmometer:
O.D.= ±..... at axis.....
O. S.= ±..... at axis.....

38. Manifest:
O.D. = ... Sph. =..... Cyl. axis.....=
O. S. = ... Sph. =..... Cyl. axis.....=

39. Near V.:
O.D. Reads No. .....at.....inches
O. S. Rdeas No. .....at.....inches

40. Muscle Bal.:
.....degrees Esophoria
.....degrees Exophoria
.....degrees Hyperphoria

41. Retinoscope:
O.D. =..... ..... Sph. =..... Cyl. axis.....
O. S. =..... Sph. =..... Cyl. axis..... .....

42. Cyclopleg. T.C.:
O.D. = ... Sph. = ... Cyl. axis.....=
O. S. = ... Sph. =..... Cyl. axis.....=

43. Post-Cyc. T.C.:
O.D. = ... Sph. =..... Cyl. axis.....=
O. S. = ... Sph. =..... Cyl. axis.....=
O.D. with above reads No.....at.....inches
O. S. with above reads No.....at.....inches

44. Prescription:
Date.....*See also R Book*.....*Page*.....

		SPH.	CYL.	AXIS	PRISM	BASE
DISTANCE	RIGHT					
	LEFT					
READING	RIGHT					
	LEFT					

45. Miscellaneous

46. History, (*Cont'd from top of reverse, see No. 7*)

47. Other data concerning this patient:
See also.....Clinic Card No.....
See also Special Exam. Serial Card No. .....

eye, which it is quite important to differentiate, may be said to be four, namely:

1. Those which have to do with the conjunctiva;
2. Those which deal with the cornea;
3. Those which deal with the iris;
4. Those which deal with the tension of the eye.

The differential diagnosis will concern itself therefore largely with a judgment as to whether the inflamed condition is a conjunctivitis, a keratitis, an iritis, or a glaucoma. In addition to the above four major groups, the following special conditions might also be remembered:

A. If the orbital tissues are especially injured, we may have to consider also a traumatic or infective cellulitis.

B. As regards injuries, there may be trauma to any of the tunics previously mentioned, so that here we can deal with traumatic infections of the conjunctiva, cornea, iris, and other tissues; and these may vary all the way from simple mechanical inflammations to an infection that can present the picture of a panophthalmitis.

C. The comparatively mild inflammation associated with lid conditions, such as an occluded Meibomian gland (chalazion); an infected eyelash follicle (hordeolum or stye); and the irritation due to malposed eyelashes (trichiasis), must also be remembered.

D. With the comparatively infrequent inflammations of the sclera, this paper will not concern itself, for as stated before, the particular and more important conditions to be differentiated, are the various forms of acute conjunctivitis, acute iritis, keratitis, and the acute glaucoma.

In making the differential diagnosis of these conditions, the facts noted on the history card which has been passed to you, will give most of the data that is necessary. In the consideration of the facts there noted, the following additional differential points may be kept in mind.

Tension. Glaucoma shows the increased tension, and, therefore, in making your examination, it is well to take this tension through the gently closed lids by palpation; or if you wish to be more exact, with the instrument known as the tonometer. The tension is not changed in conjunctivitis, or in keratitis, and only occasionally to a slight extent in iritis. Glaucoma is most frequently found in patients past the age of forty.

Pain. In all these acute inflammations, there is pain; that in conjunctivitis being least, the condition there being more one of discomfort, with smarting of lids, of a feeling of sand and of foreign substances. The combinations of sharp and spasmodic pain in a tender eyeball (usually worse at night), is the type usually associated with iritis. The glaucoma pain, while extreme at times, does not as a rule increase at night. In the corneal inflammations, the globe is usually not so tender, nor is the pain so severe as in glaucoma or iritis.

Secretion. The many glands of the conjunctiva make for an increased secretion when that tissue is inflamed, and consequently the lids are more apt to be sticking together in the morning, in conjunctivitis. In the other conditions, the secretion of mucous in not so great, although in the inflammations of the cornea, the increased lacrimation is apt to be marked.

Vision. The vision would naturally not be much affected in simple inflammation of the lids; but in glaucoma, there may be a sharp and early decrease; while in iritis, the diminution is usually less and generally more gradual. In the corneal inflammations, the diminution of vision depends largely upon the amount of turbidity of the cornea and aqueous.

Vascular Changes. The vascular changes are a picture somewhat of the blood supply to the regions specially involved, the injection in the different kinds of conjunctivitis showing superficial blood vessels that are movable with the conjunctiva; the greatest amount of injection being on the lids, and being less as one approaches the edges of the cornea. In iritis and keratitis, the sclerocorneal region usually shows marked vascular injection, the color in iritis being reddish, while in keratitis there is more of a pinkish hue, the vessels breaking up into a little network outside the limbus.

Photophobia. As regards the patient's dread of light, the greatest amount of photophobia is seen in the corneal inflammations, the amount of photophobia being quite slight in the other conditions.

Corneal Sensitiveness. If the cornea be touched with a small brush of cotton on the end of a toothpick, there can usually be determined a diminution of sensitiveness in the glaucoma, while in keratitis, the sensitiveness is apt to be increased.

In the above we have been dealing largely with symptoms and general signs. When we begin to consider the individual eye tunics themselves, we can note among other factors, the following:

Conjunctiva. The conjunctiva is naturally involved in a conjunctivitis, and when the inner aspect of the lid is examined, it is usually seen to be quite red and swollen; but in glaucoma there is no change of any special note, nor much in keratitis; and only in iritis are we apt to find any thickening of the conjunctiva, and that usually not much.

Translucency of Cornea. A localized or general change in the translucency of the cornea may be noted in a keratitis, and in a glaucoma there may be a steaminess; while in iritis there will be less change in the cornea, unless of a secondary involvement.

Anterior Chamber. The anterior chamber is practically normal in these four diseases, except in glaucoma, when its depth becomes decreased because of the pushing forward of the iris and lens.

Iris. The iris shows its greatest change in iritis, losing its gloss somewhat, and being either discolored or swollen. In the corneal and conjunctival affections, there is no special change in the iris; but in an acute glaucoma, the iris markings may be less sharp.

Pupil. The pupil in conjunctival and corneal infections remains practically normal, but in iritis usually a small pupil is met with, which responds

sluggishly or not at all to light, and which may have an irregular form if adhesions be present. In glaucoma, on the other hand, the pupil is usually dilated, but here also its response is slow, and the pupillary area is furthermore apt to take on a greenish color.

IN CONCLUSION.

This concludes the consideration of the factors which are usually taken into account in making the differential diagnosis in the four major types of inflammation we have been discussing, namely in acute conjunctivitis, iritis, keratitis, and glaucoma.

It need hardly be emphasized that an exact diagnosis is of special significance when we deal with iritis and glaucoma, because the therapeutic indications are not only virtually opposite, but if the proper medications of the one are used for the other, the results are apt to lead to grave consequences; for in iritis, while atropin is a great standby, both in the relief of pain and in resolution of the disease process, this same atropin, when used in a case of glaucoma, will help increase the pain and may do irreparable injury to the sight.

Lack of time prevents the discussion of further differential points involved in the various types of conjunctivitis, such as the simple follicular, the phlyctenular, the purulent, and the trachomatous types; nor can we discuss here the various forms of iritis, keratitis, and glaucoma.

It is hoped, however, that what has been presented may be of some service to you who are general practitioners in giving you a brief resurvey of some of the conditions that you not infrequently meet with in your own practice, and which you are often either called upon to treat, or to refer to some ophthalmologist.

OPERATIVE PROCEDURES OF OCULAR MUSCLES IN HETEROPHORIAS.*

By E. W. ALEXANDER, B. S., M. D., San Francisco.

When is one justified in resorting to surgical methods of treatment in heterophoria and what surgical procedure should be used? I have not selected this subject with the expectation of presenting anything original, but in the hope of stimulating a discussion on a rational treatment of a decidedly distressing condition, which receives very scanty or disjointed consideration by many ophthalmologists. The subject is a very large one and has been freely treated in magazines and monographs, sometimes requiring several volumes. Therefore I will proceed directly to the discussion of concrete examples rather than to the review of the text, with which you are familiar.

Case 1. A young woman with exophoria complained of the usual symptoms of frontal to occipital headache, "pulling" sensation in the eyes during accomidation, dizziness, nausea, etc.

Examination showed O. D. V. w—0.37=+0.62 x 100 =6/6+; O. S. V. w—0.37=+0.75 x 85=6/5. Screen test, divergent tendency. Phorometer, Exophoria 4°—6°; adduction 6°; abduction 8°.

The patient's mother had had ten or twelve operations, consisting of snipping one or more muscles, until the symptoms were relieved, for a similar condition. The same program had been advised for the daughter without preliminary cycloplegic refraction or treatment.

This case is clearly one of insufficiency of the internal recti, either due to intrinsic muscular power, or to one of those subtle co-ordinative functions of the motor nerves. In the latter event educational and other types of exercises should be taken up, together with an exhaustive search for a source of reflex irritation. This is beyond the scope of my paper. Taking for granted that the case quoted is one of intrinsic muscular insufficiency, it is perfectly clear that the only type of operation which could be utilized would be some sort of advancement, and not "nicking."

Any way of giving increased mechanical advantage which suits the fancy of the surgeon could be used; either tucking, shortening or advancement. I can highly recommend the advancement operation described by Dr. V. H. Hulen on account of the accuracy and stability of the scleral stitch and the advantage gained by the method of traction when tieing the sutures. However, such cases respond very well to exercises with prisms and to gymnastics. It has been my practice to give printed instructions covering such details as illumination of the room; regulation of distance from candle; posture of head; position of prism, etc. Also it is wise to inform the patient at the start that the development of muscular strength and co-ordination is educational as well as anatomical and will necessarily be tedious. Over-correction is necessary because there will be a slump in converging efficiency after the exercises are discontinued.

Except in presbyopia, incorporation of prisms in the correcting lenses in exophoria is not satisfactory in the long run. An exception to this fact is found in neurotic individuals with only a few degrees of exophoria.

Case 2. Patient complains of usual symptoms of lack of muscular equilibrium.

Examination: Vision normal with following correction: O. D.+0.12=+0.25 x 25; O. S.+0.25=+0.25 x 180. Phorometer showed Exophoria 7°; right hyperphoria 1°; adduction 6°; abduction 13.°. After exercises and gymnastics, adduction 20°, abduction 14°.

As has been the rule in cases of exophoria due to abnormally strong external recti, exercises and incorporation of prisms in the position of rest in her lenses did not relieve the intense "drawing" in the neck and eyes, occasional transitory attacks of diplopia, etc. Therefore I did a complete central tenotomy of the external rectus, reducing the exophoria to 2° where comfort was maintained by occasional periods of exercises.

In any case where there are transitory attacks of diplopia, one is justified in informing the patient in the beginning that nothing short of operation will give them ocular comfort. I have found, however, that an operation is necessary sooner or later in all young adults with 4° or 5° or more of this type of exophoria.

I feel that the proper routine to follow in these conditions, after failure with exercises and other conservative treatment, is to measure the actual turning or version power of the individual muscles with Stephens' tropometer. The normal is outward and inward 48°—53°, upward 33°, downward 50°. If the degree of exophoria is explained by a too strong version of the external rectus and

* Read at the Forty-fourth Annual Meeting of the Medical Society, State of California, Santa Barbara, April, 1914.